

DISCOVERY OF *CHEIROCRATUS* (CRUSTACEA: AMPHIPODA) ON AUSTRALIAN SHORES

By J. LAURENS BARNARD* AND MARGARET M. DRUMMOND†

* Smithsonian Institution, Washington, D.C. 20560, USA

† National Museum of Victoria, 285-321 Russell Street, Melbourne, Victoria 3000

ABSTRACT: Two new species of the gammaroid amphipod genus *Cheirocratus*, *C. bassi* and *C. praedens*, and a new genus and species, *Prosocratus butcheri* with close affinities to *Cheirocratus*, all from Australian waters, are described. A new genus, *Incratella*, is erected to accommodate *C. inermis* Ledoyer, 1967. A revised diagnosis of *Cheirocratus* and a key to all known species in the genera *Cheirocratus*, *Incratella* and *Prosocratus* are presented.

For more than fourteen decades the marine amphipod genus *Cheirocratus* has been well known in Arctic, North Atlantic and Mediterranean seas. Recently a species of the genus was described from Madagascar (Ledoyer 1967) which we propose should be transferred to a new genus *Incratella*.

We have discovered in southern Australia, and here report on two new species of *Cheirocratus* both of which show close ties to Mediterranean species; we report a third new taxon which we consider to be generically distinct from, though very closely allied to *Cheirocratus*. We assume the flow of evolutionary development proceeds from Australia towards the North Atlantic as it does in so many other groups of Amphipoda (see Barnard 1972, 1974, Barnard & Drummond 1978).

Most of the materials examined came from the two benthic surveys conducted in Western Port, Victoria, sponsored by the Victorian Government and supported by industrial organizations: Crib Point Benthic Survey, 1964-5 (CPBS) and Westernport Bay Environmental Study 1973-4 (WPBES). Acknowledgements to those concerned in these undertakings, as well as station data, have been detailed in a previous publication (Barnard & Drummond 1978). Additional material came from plankton samples collected in Western Port by R. H. Miller, University of Melbourne (RHM); from Tasmania (collected by T. Walker); from the Bass Strait survey at present being conducted by the Victorian Institute of Marine Science (VIMS); from the Queensland University Survey of Middle Banks, Moreton Bay, Queensland, from Port Phillip (PPBES) and from the N.S.W. Fisheries Estuarine Benthic Survey (EBS).

LEGENDS

Capital letters and numbers on the figures denote parts, as follows: A, antenna; B, body or carcass; C, coxa; D, dactyl; E, epistome, left view; F, accessory flagellum; G, gnathopod; H, head; I, inner plate; J, ramus; K, variable, see legend; L, lower lip = labium; M, mandible; N, molar; O, palp; P, pereopod; Q, pleopod; R, uropod; S, maxilliped; T, telson; U, upper lip = labium; V, brood plate; W, pleon; X, maxilla; Y, gill; Z, gland.

The figures each contain illustrations from a master specimen listed first in the caption of each figure and no

lower case letters are placed on these figures; subsidiary specimens on each figure are denoted by lower case letters to left of capitals as specified in the caption for each figure. Lower case to the right of capitals indicate: m, medial; r, right; s, setae removed.

SYSTEMATICS

Genus *Cheirocratus* Norman 1867

TYPE SPECIES (by monotypy): *Cheirocratus mantis* Norman 1867, (= *Gammarus assimilis* Liljeborg 1852 according to Stebbing 1906: 417).

DIAGNOSIS: Body ordinary, urosomites free, dorsally denticulate and spinosetose transversely. Rostrum obsolescent, lateral cephalic lobes mamilliform, sinus present. Eyes present. Antenna 1 much shorter than antenna 2, ratio of peduncular articles = 16:16:5 (in type species), primary flagellum as long as peduncle, accessory flagellum 2+ articulate. Antenna 2 large and elongate, flagellum scarcely shorter than peduncle. Labrum as broad as long, weakly notched apically. Mandibular incisor toothed, molar tritritative, ratio of palp articles = 10:18:11 (in type species), article 3 weakly falcate or strongly sickle-shaped, setae = (A)DE. Inner lobes of labium well developed. Maxillae medially setose, inner plate of maxilla 1 ovatotriangular, fully setose medially, outer plate with 11 (rarely 9) spines, palps [?symmetrical]. Inner plate of maxilla 2 with oblique facial row of setae or strongly setose medially. Outer plate of maxilliped medially spinose, palp article 3 unlobed, dactyl shorter than article 3, unguiform, [?without nail]. Coxae of ordinary length, poorly setose, coxa 1 slightly to strongly expanded apically, coxa 4 scarcely or not, lobate. Gnathopods diverse; female gnathopods simple, feeble, wrists elongate, not lobate, hands thin, lacking palms; male gnathopod 1 like female, gnathopod 2 greatly enlarged, wrist short, not lobate, hand large, elongate, ovate, rectangular or trapezoidal, palm oblique, elongate, smooth or sculptured. Pereopods 3-4 ordinary. Article 2 of pereopods 5-7 scarcely expanded or not, almost linear, scarcely lobate or not, posterior margins weakly serratosetulate. Pleopods ordinary. Rami of uropods 1-2 marginally spinose, evenly extended, peduncle or uropod 1 [?without basofacial armaments]. Uropod 3

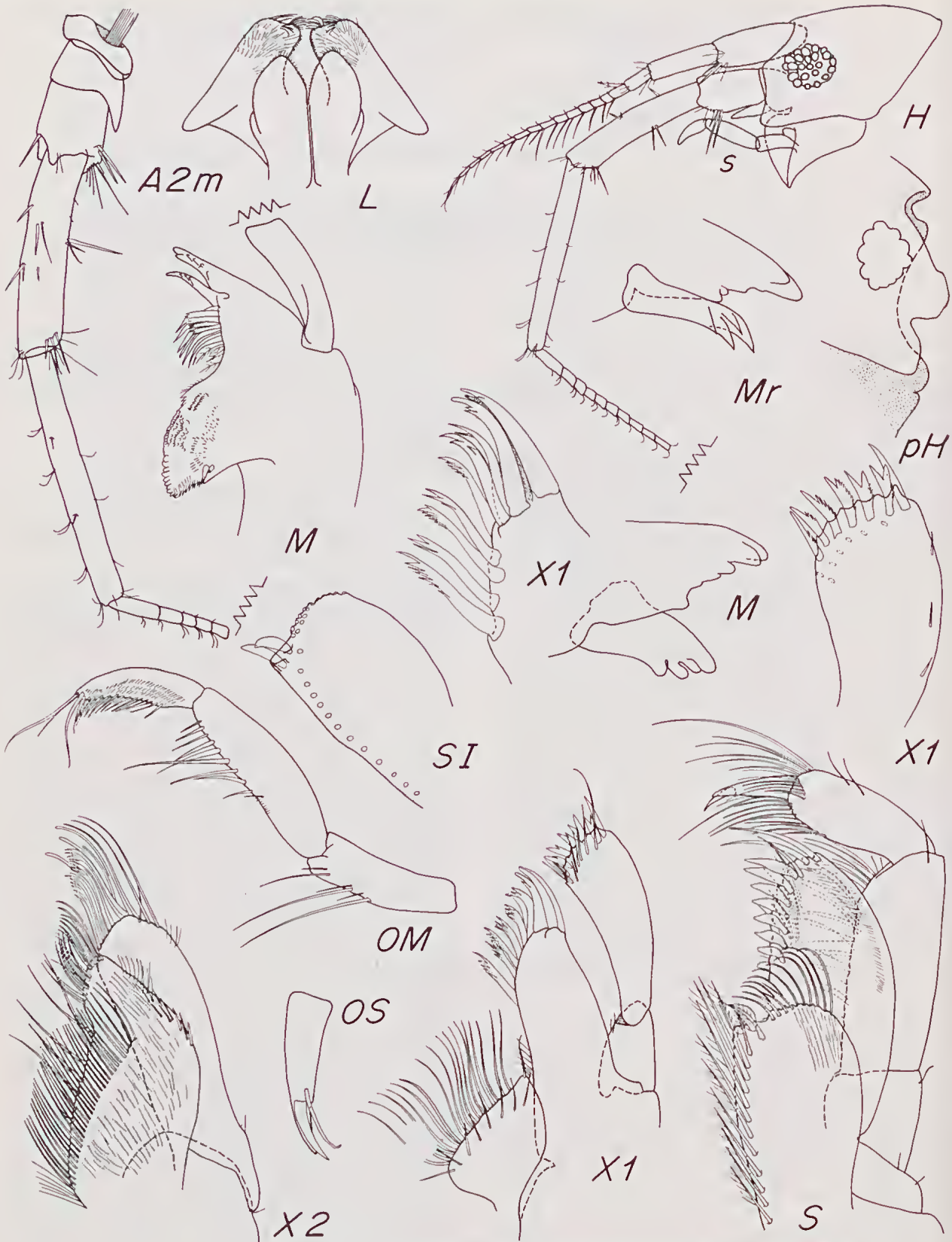


Fig. 1—*Cheirocratus bassi* sp. nov. Unattributed figures = holotype male "h" 5.80 mm; p = female "p" 4.41 mm.

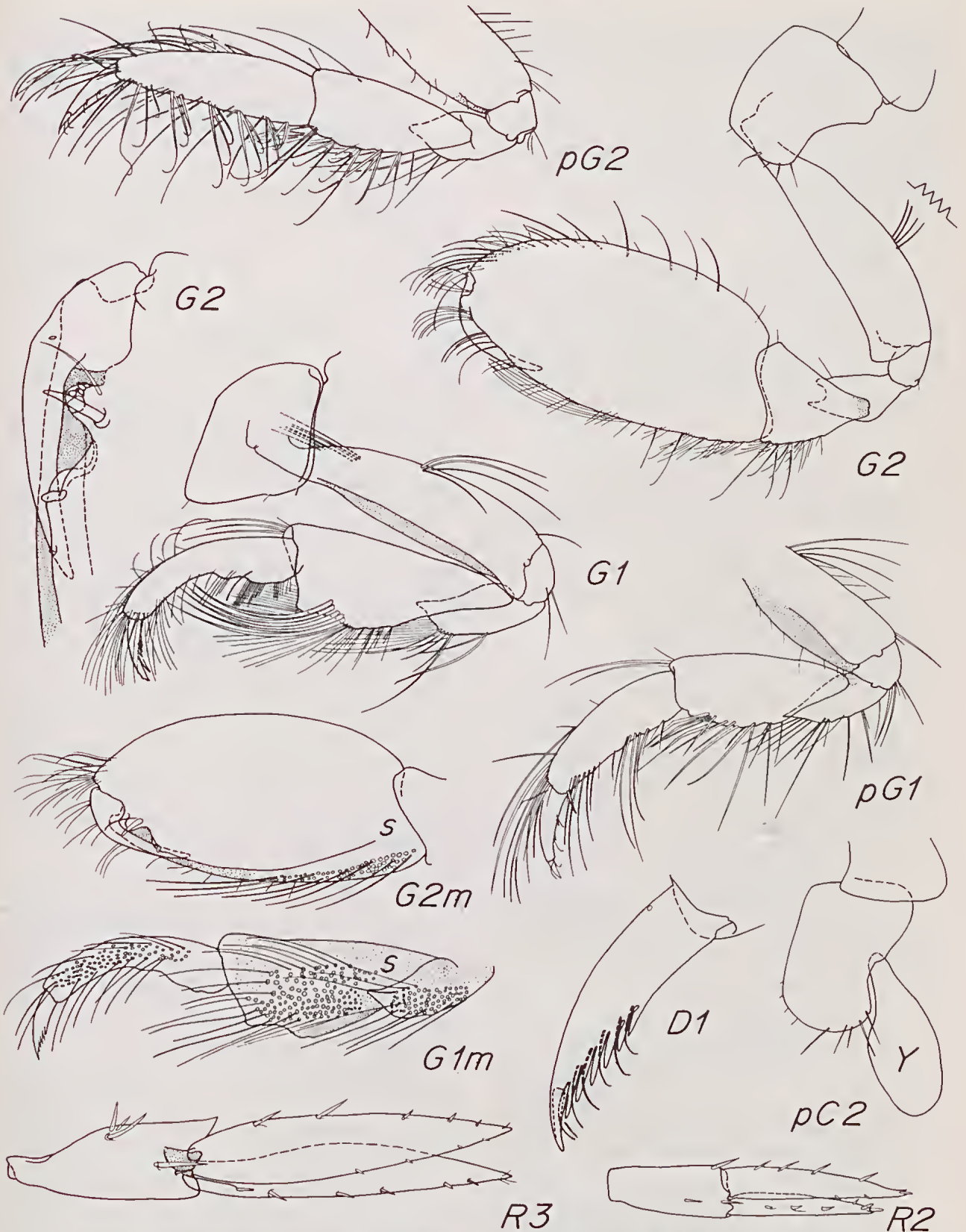


Fig. 2—*Cheirocratus bassi* sp. nov. Unattributed figures = holotype male "h" 5.80 mm; p = female "p" 4.41 mm.

extended, magniramous, almost acquiramous, peduncle elongate, rami 1-articulate, lanceolate. Telson short, deeply cleft, gaping, lobes tapering, well spinose apically. Coxal gills [2-6], ovate, occasionally pediculate. Oostegites narrow.

Variants: Telson poorly armed (*C. bassi*, *C. praedens*); male gnathopod 2 like *zeylanca melitas*, hand ovate, palm undefined and heavily setose, dactyl riding onto medial face of hand (*C. sundevalli*); mouthparts in diagnosis based on *C. sundevalli* of Sars (1895).

Relationship: Like *Cheirocratella* but female gnathopod 2 simple.

Species: See Chevreux & Fage (1925); *armatus* G. S. Karaman 1977a; *assimilis* (Liljeborg 1852) (Sars 1895) (Chevreux & Page 1925); *bassi* Barnard & Drummond herein; *intermedius* Sars 1895; *monodontus* G. S. Karaman 1977b; *praedens* Barnard & Drummond herein; *robustus* Sars 1895 (Stephensen 1928, 1929, 1940); *sundevalli* (Rathke 1843) (Sars 1895).

Key to *Cheirocratus*, *Incratella* and *Prosocratus* (modified after Karaman 1977)

(Note: *C. bassi* is placed twice in key, second time ignoring telson to show position near species from Europe)

- 1. Male gnathopod 2 simple
.....*Prosocratus butcheri* gen. et sp. nov.
Male gnathopod 2 subchelate2
- 2. Telson with thin setae but no spines3
Telson with both setae and spines5
- 3. Urosomites untoothed, article 1 of mandibular palp as long as article 3, article 2 of pereopod 7 lobate*Incratella inermis*
Some urosomites toothed, article 1 of mandibular palp longer than article 3, article 2 of pereopod 7 not lobate4
- 4. Urosomite 2 untoothed*C. armatus*
Urosomite 2 with 2 dorsal teeth ... *C. bassi* sp. nov.
- 5. Dactyl of male gnathopod 2 closing on toothed posterior palm, hinge part of palm with crenellate tooth or teeth6
Dactyl of male gnathopod 2 overriding palm onto face of hand, hinge part of palm smooth or with smooth hump7
- 6. Palm of male gnathopod 2 with 4 major teeth spread throughout palm, palm poorly setose ...
.....*C. assimilis*
Palm of male gnathopod 2 with 2 major teeth or tooth groups, one at hinge, one at defining corner, middle of palm lacking teeth but heavily setose*C. intermedius*
- 7. Dorsomedial peduncular spination of uropod 3 concentrated into group, adult male without cephalic notch, telson with only small apical flexible setules*C. bassi* sp. nov.
Dorsomedial peduncular spination of uropod 3 widespread, adult male retaining cephalic notch, telson with one or more stout and stiff apical spines8

- 8. Articles 4-6 of pereopod 7 stout, medial face of hand on male gnathopod 2 with humped setae, no spines or ridges*C. robustus*
Articles 4-6 of pereopod 7 slender, medial face of hand on gnathopod 2 with setae, ridge and spines9
- 9. Urosomite 2 with 4 dorsal teeth, epimeron 3 with straight posterior margin10
Urosomite 2 with 2 dorsal teeth, epimeron 3 with convex posterior margin ... *C. praedens* sp. nov.
- 10. Urosomite 1 with one large dorsal tooth
.....*C. monodontus*
Urosomite 1 with several small dorsal teeth (at least 3)*C. sundevalli*

Cheirocratus bassi sp. nov.

Figs 1-3

DIAGNOSIS: Cephalic notch lost in adult male; male gnathopod 2 without major palmar teeth, palm formed by inner facial ridge near posterior margin, this ridge with teeth and spines near apex, medial face with setae only near posterior margin, dactyl overriding posterior margin; articles 4-6 of pereopod 7 slender; urosomite 1 with 3 closely contiguous dorsal teeth; urosomite 2 with 2 widely spaced dorsal teeth; spines on peduncle of uropod 3 forming one group only, not queued; apices of telsonic lobes with minor armaments only.

DESCRIPTION OF MALE HOLOTYPE "h": Rostrum minute, lateral cephalic lobe weakly excavate anteriorly but notch found in juvenile obliterated in adult, anteroventral corner weakly produced; eyes round, pigment widely spread but ommatidia sparse.

Antenna 1 of medium extension, ratio of peduncular articles = 16:12:5, article 1 with 2 apical sharp teeth near spines, one above and one below, primary flagellum longer than peduncle, with thick but sparse aesthetascs, accessory flagellum 2-articulate. Antenna 2 elongate, much longer than antenna 1, gland cone large, extending 50% or more along article 3, article 5 of peduncle longer than 4, flagellum clongate.

Upper lip broad, entire, rounded.

Mandibular incisors weakly toothed, right lacinia mobilis thin, narrow, left broad, flat, each 4-toothed; raker spines main row with 7, accompanied by 7 vestigial fern-like setae near molar, left rakers like right but subsidiary row with only 2 rakers; molars large, poorly triturate; tiny setule on the left, longer weak seta on the right; mandibular palp large, ratio of articles = 11:14:9, articles 1 and 2 with inner setae, article 3 weakly falcate, setae of article 3 = DE.

Inner lobes of lower lip large and fleshy, outer lobes with medial gape. Inner plate of maxilla 1 broadly pyriform, leaf-like, fully setose medially, also with facial setae, outer plate slender, with 11 spines; palps 2-articulate, symmetrical, apices truncate, with simple, bifid pectinate spines and facial setae, and outer marginal row of 3 facial setal-spines. Inner plate of maxilla 2 broader and shorter than outer, somewhat geniculate, with fully developed oblique facial row of setae, some outer marginal setal-spines, sparse medial

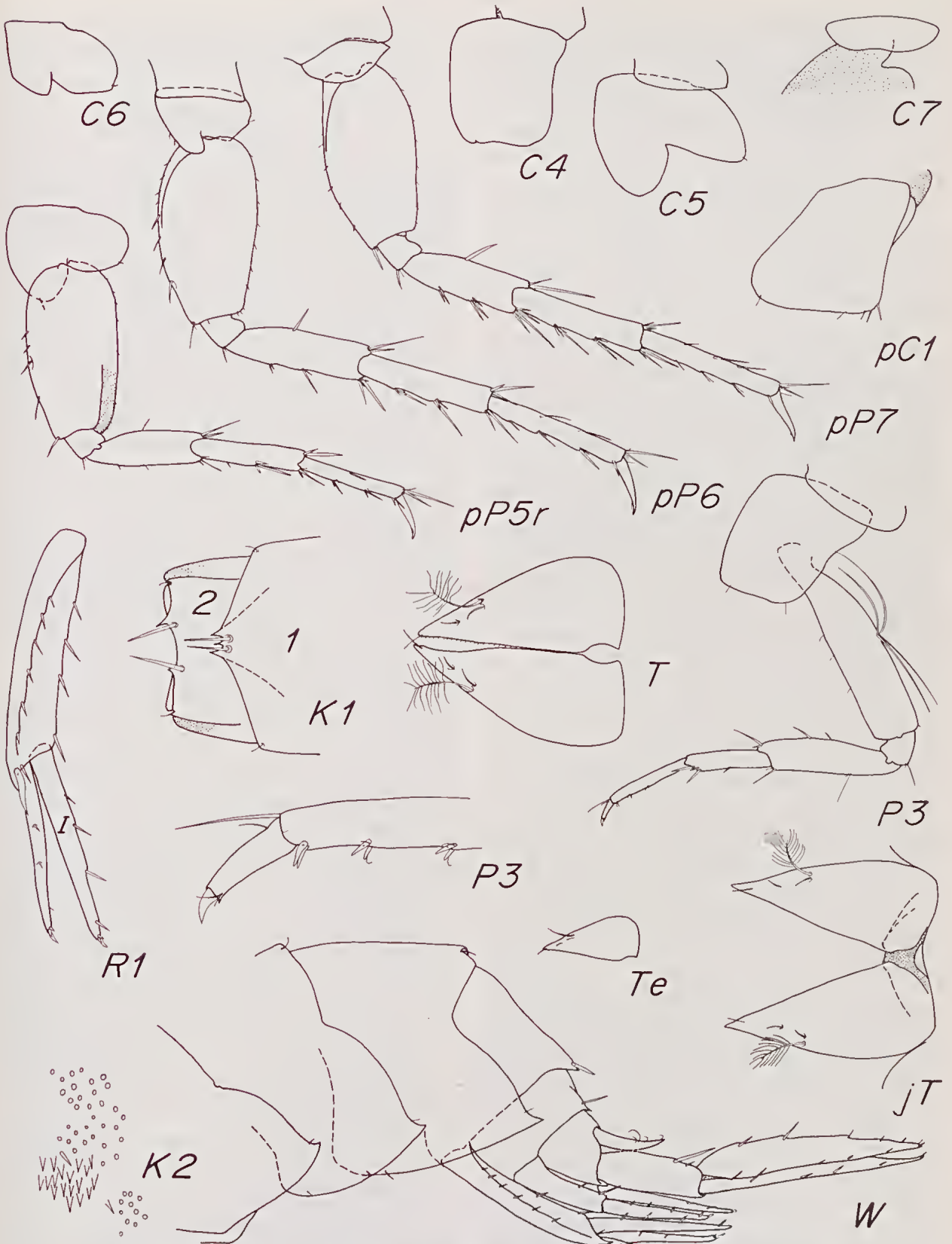


Fig. 3—*Cheirocratus bassi* sp. nov. Unattributed figures = holotype male "h" 5.80 mm; j = male "j" 5.34 mm; p = female "p" 4.41 mm; e marks figure drawn to same size as uropod 3 on Fig. 2; K1, dorsal urosome; K2, cuticle of pereopod 5.

and dense apical setae; outer plate almost evenly rectangular, with 3-4 apicolateral setae and dense apical setae. Inner plate of maxilliped broad, truncate, with 2 inner apical spines, medially and apicolaterally setose; outer plate ovate, medially and apically spinose; palp article 2 elongate, article 3 shorter, unlobate, dactyl shorter, uniform, with partly immersed nail and accessory setule; palp poorly setose laterally.

Coxae 1-5 of medium length, extending almost equally, only coxa 2 with long setal-spines; coxa 1 expanded apically and with short armaments, other coxae poorly armed; coxa 2 constricted midposteriorly; coxae 3-4 subrectangular, 4 not significantly excavate, 3 slightly longer than 4; coxa 5 bilobed; coxae 6-7 shorter than 5.

Gnathopod 1 slender, small, simple; wrist elongate, weakly but broadly lobate posteriorly; hand very slender, weakly bent, irregularly tapering, posterior margin at base sinuous, palm absent, dactyl short, curved, serrate. Wrist of gnathopod 2 short, not lobate, posterior margin with moderately developed setal clumps; hand very large, elongate, ovate, anterior margin setose, posterior margin smooth, convex, with dense inner facial setae near base, medial face with heavy ridge near posterior margin, broken into 2 processes near hinge, distal process with long spine, long seta, 4-5 small jewel-like spines, proximal process with one medium spine; dactyl fitting into slot formed by ridge and palmar margin, strongly bent, short; dactyl interpreted to be overriding margin onto face of palm; longer setae on wrist of gnathopod 1 and hands of both gnathopods extremely thick and with basal bulbs.

Pereopod 4 smaller than pereopod 3.

Article 2 of pereopods 5-7 scarcely expanded, not lobate, posterior margins weakly serratosetulate; legs slender; pereopods 6 and 7 subequal in length.

Pleopods ordinary. Pleonites 1-5 each with dorsal posterolateral setule in weak notch; epimera 1-3 with sinuous posterior margin and sharp medium posteroventral tooth marked with weak setule; ventral margin of epimeron 2 with one weak spinule, of epimeron 3 with 2 weak anteroventral spinules.

Urosomites 1-2 dorsally toothed, urosomite 1 with 3 dorsal teeth in tight group, this complex armed with 2 setal spines; urosomite 2 with 2 widely spread dorsal teeth each armed with setal-spine.

Uropods 1-2 extending equally, outer rami scarcely shortened, all rami with marginal spines and weakly spinose apices; peduncle of uropod 1 with both margins spinose, no basofacial spine, apicolateral margin with small sharp cusp, large spine and small spine. Uropod 2 peduncle with 2 lateral spines and one medial. Uropod 3 strongly extended, peduncle slightly elongate, apicodorsal margin with 2 spines in tandem, midmedial margin with cluster of 3 spines, apicomedial margin with cusp; rami elongate, lanceolate, weakly spinose along margins. Telson very short, cleft to base, lobes slightly separate at base, each lobe tapering to sharp point and bearing weak subapical setule, one dorsal setule, pair of dorsolateral setules greatly distad.

Coxal gills on pereonites 2-6, sausage-shaped.

Cuticle under medium power appearing to be pebbled, under oil-immersion pebbles seen to be poorly developed (only well refractive on low power), composed of complex concentric interrupted line-pairs, in places yielding to or basally underfounded by sharp scales; cuticle also with occasional spikes or studs and fine bulbar setules.

DESCRIPTION OF FEMALE "p": Lateral cephalic lobe with deep notch like juvenile. Antenna 1 like male; flagellum of antenna 2 only as long as articles 4-5 of peduncle combined.

Gnathopod 1 generally like that of male but hand less grotesque, tapering evenly, wrist more softly rounder posteriorly. Gnathopod 2 feeble, simple, wrist and hand both elongate, dactyl with 2 inner spinules each with partner setule, palm and posterior margin confluent and bearing several groups of apically curled setae.

Both epimera 2-3 with 2 strong anteroventral spine-setae, much stronger than in male holotype. Brood plates very slender.

DESCRIPTION OF MALE "g": Right maxilla 1 with 9 spines on outer plate.

ILLUSTRATIONS: Mandibular incisors and laciniae mobiles when shown together spread apart; main spines of mandibular raker row with bases heavily broadened and from side view appearing to form secondary spine row; maxillae 1-2 equally magnified. Small version of one telsonic lobe magnified equally to uropod 3. Larger telsonic versions greatly enlarged.

HOLOTYPE: NMV J1631 male "h" 5.80 mm.

TYPE LOCALITY: WPBES 1749/1, Australia, Victoria, Western Port, 25 November 1974, 14 m, sand with mud, silt, clay.

PARATYPES: NMV J1632-1636. The type-locality, 6 other specimens, including male "j" 5.34 mm; CPBS A1/1, female "p" 4.41 mm; RHM, male "g", 5.86 mm; 21 (2) dredged WP, 20/2/78, female "q".

RELATIONSHIP: *Cheirocratus bassi* resembles *C. armatus* particularly in the lack of thick spines on the telson and the lack of significant incision in the cephalic lobe. The other known species of *Cheirocratus* have apically spined telsons and markedly incised cephalic lobes in addition to individual gnathopodal distinctions. *C. bassi* differs from *C. armatus* in the presence of teeth on the second urosomite. *C. monodontus* and *C. praedens* sp. nov. each have only one tooth on urosomite 1 instead of the 3 in *C. bassi*; *C. sudevallii* has 4 (instead of 2) on urosomite 2; and in both *C. robustus* and *C. assimilis* percopod 7 is unequal in length to pereopod 6 and stouter, in contrast to *C. bassi* in which pereopods 6 and 7 are slender and subequal.

MATERIAL: CPBS, 77 samples from 33 stations (258 specimens); WPBES, 8 samples from 5 stations (23 specimens); RHM 27/10/71 (1 specimen); PPBES, 4 samples from 2 stations (4 specimens).

DISTRIBUTION: Australia, Victoria, Western Port, Port Phillip and Bass Strait, 0-36 m, fine to coarse sand, muddy sand, gravelly sand, sand and shell.

ETYMOLOGY: The species is named for George Bass, physician, who discovered and named Western Port in 1797.

***Cheirocratus praedens* sp. nov.**

Figs 4, 5 (upper)

DIAGNOSIS: Cephalic notch persistent in adult male; male gnathopod 2 without major palmar teeth, palm formed by inner facial ridge near posterior margin, this ridge with teeth and spines near apex, apical process very broad with about 6 spines, medial face with setae in middle stripe and near posterior margin, dactyl overriding posterior margin; articles 4-6 of pereopod 7 slender; urosomite 1 with one medium sized dorsal tooth, urosomite 2 with 2 widely spaced dorsal teeth; spines on peduncle or uropod 3 widely spread; apices of telsonic lobes with at least one thick spine each.

DESCRIPTION OF MALE HOLOTYPE "k": Rostrum minute, lateral cephalic lobe strongly notched anteriorly, anteroventral corner rounded; eyes round, pigment fully covered by morula of ommatidia.

Antenna 1 short, reaching about half way along peduncular article 5 of antenna 2, ratio of peduncular articles is 16:14:5, article 1 with 2 apical sharp teeth near apex, one medial and one lateral; primary flagellum longer than peduncle, with thick but sparse aesthetascs; accessory flagellum 2 articulate. Antenna 2 elongate, much longer than antenna 1, gland cone large, article 5 of peduncle longer than 4, flagellum elongate.

Upper lip broad, entire, almost truncate below.

Mandibular incisors weakly toothed, right lacinia mobilis thin, left flat broad each 4 toothed; raker spines main row with 9, accompanied by 3-4 vestigial fern-like setae near molar, left and right sides similar; molars large, poorly triturative, with conspicuous medium-sized seta each; mandibular palp large, ratio of articles is 9:11:8, article 3 weakly falcate, articles 1 and 2 with inner setae (article 1=medial, 3 large; apicomedial, 1 medium 1 setule; apicolateral, 1 setule; article 2=medial, 15 mixed setae), setae of article 3=DE (medial=17, apical=3 large and 1 small). Inner lobes of lower lip large and fleshy, outer lobes with medial gape. Inner plate of maxilla 1 broadly pyriform, leaf-like, fully setose medially, also with facial setae; outer plate slender, with 11 spines, palps 2-articulate, symmetrical, apices truncate, with simple, bifid and pectinate spines and facial setae, also with outer marginal row of 3 setules (widespread). Inner plate of maxilla 2 broader but scarcely shorter than outer, somewhat geniculate, with fully developed oblique facial row of setae, some outer marginal setal spines, sparse medial and dense apical setae, outer plate almost evenly rectangular, with 2 apicolateral setae and dense apical setae.

Inner plate of maxilliped broad, truncate, with 2 inner apical spines, medially and apicolaterally setose, outer plate ovate, medially and apically spinose, palp article 2 elongate, article 3 shorter, unlobate, dactyl shorter, unguiform, with partly immersed nail and accessory setule; palp poorly setose laterally.

Coxae 1-5 of medium length, extending equally, only coxa 2 with long setal spines but some on coxa 1 short and thick, other coxae poorly armed; coxa 1 expanded apically, coxa 2 weakly constricted midposteriorly, coxae 3-4 subrectangular, 4 not significantly excavate, 3 and 4 equally extended, coxa 5 bilobed, coxae 6-7 shorter than 5.

Gnathopod 1 slender, small, simple, wrist elongate, broadly rounded but not lobate posteriorly, hand very slender, almost straight, tapering, sinuosity very minor, palm absent, dactyl short, curved, serrate. Wrist of gnathopod 2 short, not lobate, posterior margin with moderately developed setal clump, hand very large, elongate, ovate, posterior margin smooth, convex, with dense inner facial setae on posterior margin and stripe down middle of face, medial face with heavy ridge near posterior margin. Ridge broken into broad process near hinge, armed with 6 small, jewel-like spines, plus proximal process with one spine; dactyl wiping ridge between both processes, strongly bent, short, dactyl interpreted to be overriding palm onto face of hand; anterior margin of hand setose, longer setae on wrist of gnathopod 1 and hands of both gnathopods extremely thick and with basal bulbs.

Pereopod 4 scarcely smaller than pereopod 3.

Article 2 of pereopods 5-7 scarcely expanded, not lobate, posterior margins weakly serratosetulate, legs slender.

Pleopods ordinary. Plconites 1-2 each with dorsolateral setule, epimera 1-3 with sinuous posterior margin and sharp posteroventral tooth marked with weak setule. Ventral margin of epimeron 2 with 4 strong setal spines, of epimeron 3 with 5 similar armaments.

Urosomite 1 with strong dorsomedial tooth, urosomite 2 with pair of small dorsal teeth. Uropods 1-2 extending equally, outer rami scarcely shortened, all rami marginally and apically weakly spinose; peduncle of uropod 1 with both margins spinose, without basofacial spine, apicolateral margin with small sharp cusp, large spine and small spine; peduncle of uropod 2 with 3 lateral and 2 medial spines. Uropod 3 strongly extended, peduncle scarcely elongate, apicodorsal margin with 2 spines in tandem, medial margin with 2 spines in group and 2 spines in tandem, apicomedial margin with cusp; rami elongate, lanceolate, weakly spinose along margins.

Telson very short, cleft to base, lobes slightly separate at base, each tapering to sharp point with weak subapical inner notch armed with small stout spine (one side with second spinule) and one setule; dorsolateral surface with setule and partner (variable, either spine or long plusetule).

Coxal gills on pereonites 2-6, sausage-shaped.

Cuticle under medium power appearing to be pebbled, under oil-immersion pebbles seen to be poorly developed (only well refractive on low power), composed of complex concentric interrupted line-pairs, in places yielding to or basally underfounded by sharp scales; cuticle also with occasional spikes or studs and fine bulbous setules.

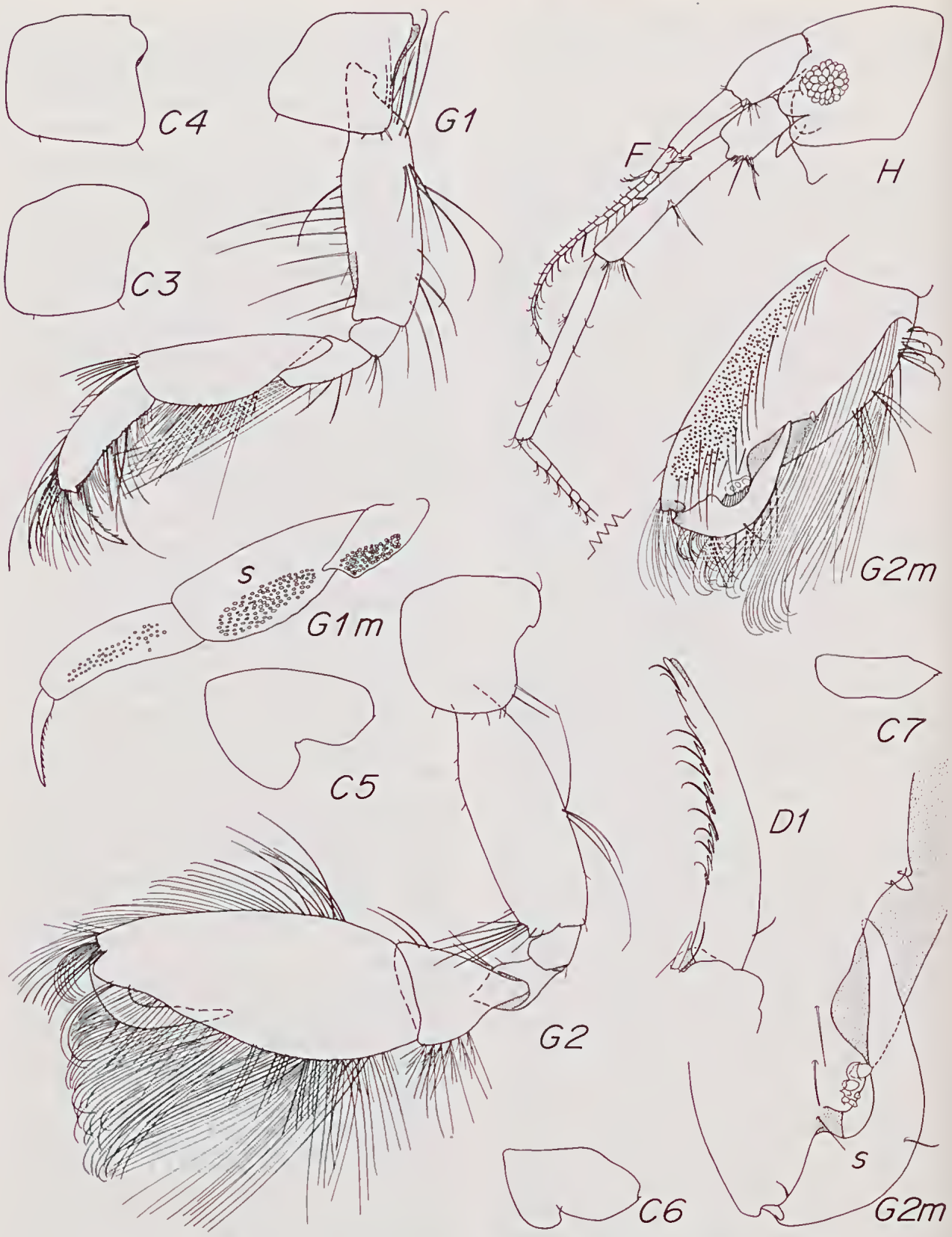


Fig. 4—*Cheirocratus praedens* sp. nov. Holotype male "k" 12.10 mm.

ILLUSTRATIONS: Many parts similar to those of *C. bassi* and not repeated for this species: upper lip, epistome, mandibles, lower lip, cuticle; maxilla 2 figured in outline only. Minor distinctions from illustrations of *C. bassi*, noted but not illustrated separately: inner plate of maxilla 1 with 26 medial, 11 facial and 3 apical setae, palp apex with 10 spines (2 more thin medials and one extra bifurcate) in pattern similar to *C. bassi*; inner plate of maxilliped with 15 medial setae, outer with 2 thin apical spines and 11 thick medials, article 3 of palp with 4 lateral setae in groups of 3 and 1; pereopods 3 and 4 slightly better armed; pereopod 5 with 3 posteroventral cusps and 2 setules on article 2 and pair of small posteroventral spines on article 5; pereopods 6 and 7 with 2 posteroventral cusps and one setule on article 2 and article 4 more elongate (see formulae below); peduncle of uropod 1 with 5 lateral and 6 medial spines, of uropod 2 with 3 lateral and 2 medial; outer ramus of uropod 1 with 4 small lateral spines and 3 small medials, apex with 2 spines, one large, one small, and 2 cusps; outer ramus of uropod 2 with 4 large lateral and 4-5 small medial spines, apex with one large and one small spine, and 2 cusps; inner ramus of uropod 1 with 3 small lateral and 5 large medial spines, apex with one medium spine and 2 cusps; inner ramus of uropod 2 with 3 small lateral and 6 large medial spines, apex with one large spine, one small spine and 2 cusps. Length ratio of articles 2, 4, 5 of pereopod 6 = 65:53:48 and of pereopod 7 = 61:50:51. (For *Cheirocratus bassi* these ratios are 65:47:50 and 62:42:51.)

HOLOTYPE: NMV J1637 male "k" 12.10 mm.

TYPE LOCALITY: Tasmania, 400-600 m east of Middleton, BBN/T.L., weed bottom, 5 October 1973, collected by Terry Walker.

RELATIONSHIP: *Cheirocratus praedens* differs from *C. monodontus*, from the Mediterranean Sea, in the presence of only 2 (not 4) dorsal teeth on urosomite 2, the bulging posterior margin of epimeron 3, the lack of ventral armament on epimeron 1, the very sparse armament of the telson and the produced midfacial ridge on the hand of male gnathopod 2. It differs from *C. bassi*, its Australian compatriot, in the presence of only one tooth (not 3) on urosomite 1, the absence of spines on urosomites 1 and 2, the presence of a cephalic notch in fully adult male, the stronger medial cavity and more heavily armed hand of male gnathopod 2, the weaker development of gnathopod 1 in the adult male, in which article 5 is narrower and article 6 less sculptured, and the narrower hand of male gnathopod 2 relative to coxa 2, with larger dactyl.

This species shows many similarities to *C. sundevalli* (Rathke) from Europe, but differs from that species in having fewer dorsal teeth on the urosomites (1 and 2 contrasted with 3 and 4), in the convex posterior margin of epimeron 3, the more pointed telsonic lobes with fewer spines (1-2 as against 3), the larger apical process on the inner palmar face of gnathopod 2 with more spines (6 as contrasted with 2), and the shorter peduncle of uropod 3.

The holotype of this species also differs from *C. bassi*

in various characters assumed to reflect its large adult size: the ventral spines on urosomites 1 and 2 (absent in *bassi*), thicker armaments on the telsonic apices, stronger or denser spination on peduncle of uropod 3 and epimera 2-3, broader, coxa 3 and the longer reach on the inner plate of maxilla 2.

MATERIAL: A second specimen of *Cheirocratus praedens* was taken in a lately-sorted sample from Bass Strait (VIMS station 110, 16m, fine, shelly sand, 3/11/80). This female, 11.2 mm in length with setose brood plates, has simple gnathopods closely resembling those of females figured for *C. bassi* and *Prosocratus butcheri*. From these two species, however, it is readily distinguished by the single, very large tooth on the first urosomite. In other respects the female conforms closely to the description of the male holotype.

DISTRIBUTION: Tasmania, intertidal.

ETYMOLOGY: From the Latin *prae* meaning "in front" and *dens* meaning "a tooth"—refers to the single tooth on the first urosome.

Genus *Incratella* nov.

DIAGNOSIS: body unornamented, urosome not dorsally setose. Rostrum [?small, lateral cephalic lobes deeply notched, ? sinus present]. Antenna 2 elongate, antenna 1 much shorter than 2, ratio of peduncular articles = 35:21:10, primary flagellum as long as peduncle, accessory flagellum 2-articulate. Articles 4-5 of peduncle on antenna 2 thin, elongate, flagellum longer than article 5.

Labrum about as long as broad. Mandibular molar large but poorly triturative, ratio of palp articles = 11:15:13, article 3 slightly curved, blunt, setae = DE. Inner lobes of labium large. Maxillae medially setose; inner plate of maxilla 1 broadly ovate, fully setose medially, outer plate with [?5] spines, palps [?symmetrical with elongate article 1]. Inner plate of maxilla 2 with oblique facial row of setae. Coxae of ordinary length to slightly shortened, almost glabrous, coxa 1 strongly expanded, coxa 4 quadrate, unexcavate. Female gnathopods simple, feeble, wrists elongate, unlobate, hands thin, lacking palms; male gnathopods unknown.

Article 2 of pereopods 5-7 moderately expanded, weakly (5) to moderately (7) lobate, posterior margins lacking large setae.

Rami of uropods 1-2 marginally but poorly spinose, evenly extended, peduncle of uropod 1 [?without basofacial armaments.] Uropod 3 extended, magniramous, almost aequiramous, peduncle slightly elongate, rami 1-articulate, lanceolate. Telson short, cleft, gaping, lobes weakly tapering, not spinose apically.

Coxal gills [?2-6] ovate. Oostegites [?narrow].

TYPE SPECIES: *Cheirocratus inermis* Ledoyer 1967.

RELATIONSHIP: Like *Cheirocratus* but urosomites un-toothed. Male unknown.

SPECIES: *Incratella inermis* (Ledoyer 1967) Griffiths, 1975; Madagascar and southern Africa, sublittoral, 1.

ETYMOLOGY: The generic name *Incratella* is contrived from word fragments.

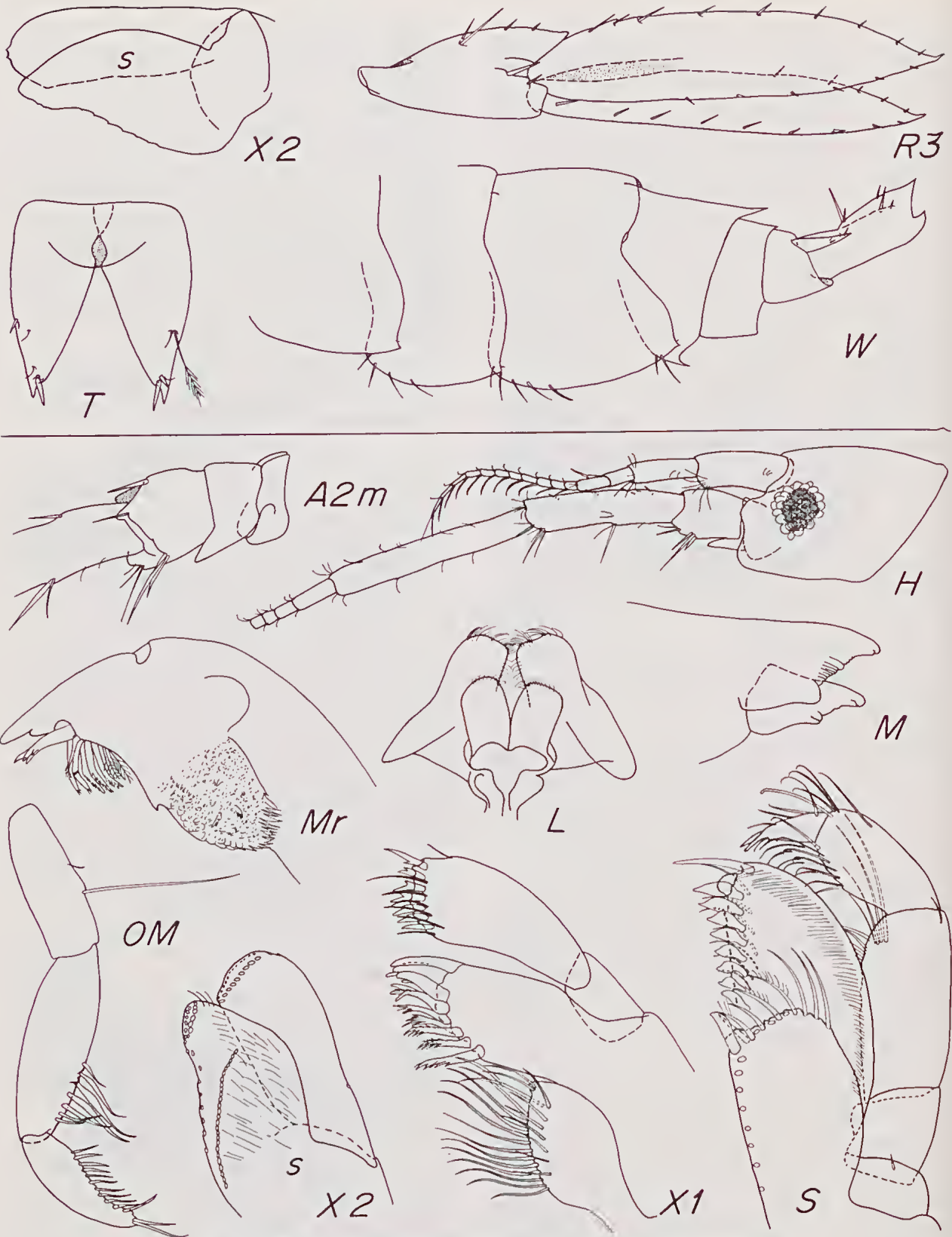


Fig. 5—Upper, *Cheirocratus praedens* sp. nov. Holotype male "k" 12.10 mm. Lower, *Prosocratus butcheri* gen. nov. et sp. nov. Holotype male "n" 4.34 mm.

Genus *Prosocratus* nov.

DIAGNOSIS: Body ordinary, urosomites free, dorsally denticulate and spinosetose transversely. Rostrum obsolescent, lateral cephalic lobes subtruncate, sinus absent. Eyes present. Antenna 2 elongate, antenna 1 much shorter than antenna 2, ratio of peduncular articles is 16:11:5 (in type-species), primary flagellum as long as peduncle, accessory flagellum 2-articulate. Antenna 2 large and elongate, scarcely shorter than peduncle. Labrum as broad as long, weakly notched apically. Mandibular incisors scarcely toothed, molar triturative, ratio of palp articles = 11:13:9 (in type-species), article 3 weakly sickle-shaped, setae = DE. Inner lobes of labium well developed. Maxillae medially setose, inner plate of maxilla 1 ovatotriangular, fully setose medially outer plate with 11 spines, palps symmetrical. Inner plate of maxilla 2 with oblique facial row of setae, strongly setose medially. Outer plate of maxilliped medially spinose, palp article 3 unlobed, dactyl shorter than 3, unguiform, nail almost fused, with secondary scale. Coxae of ordinary length, poorly setose, coxa 1 weakly expanded, coxa 4 scarcely lobate. Gnathopods diverse; female gnathopods simple, feebly, wrists elongate, not lobate, hands thin, lacking palms; male gnathopod 2 like female but article 2 very broad, gnathopod 1 enlarged, strongly subchelate, wrist elongate, hand broad, dactyl very long and strongly overlapping transverse sculptured palm. Pereopods 3-4 ordinary. Article 2 of pereopods 5-7 weakly expanded, not lobate, posterior margins weakly setulate. Pleopods ordinary. Rami of uropods 1-2 marginally spinose, evenly extended or outer ramus of uropod 2 shortened, peduncle of uropod 1 without basofacial armament. Uropod 3 extended, magniramous, almost aequiramous, peduncle elongate, rami 1-articulate, lanceolate. Telson short, fully cleft, gaping, lobes tapering, poorly spinose apically. Coxal gills 2-6 ovate, occasionally pediculate. Oostegites narrow.

TYPE SPECIES: *Prosocratus butcheri* sp. nov.

RELATIONSHIP: Differing from *Cheirocratus* in the axial reversal of male gnathopodal dominance, gnathopod 1 dominating instead of gnathopod 2.

ETYMOLOGY: From the Greek *proso*, "in advance of" and *kratos* "power", refers to the dominance of the first gnathopod.

Prosocratus butcheri sp. nov.

Figs 5 (lower), 6, 7

DIAGNOSIS: With the generic characters, thus male gnathopod 1 dominant; female with articles 4-6 of pereopod 7 slender; urosomite 1 with 3 closely contiguous dorsal teeth; spines on peduncle of uropod 2 in 2 groups of 2 each; apices of telsonic lobes with minor armaments only.

DESCRIPTION OF HOLOTYPE MALE "n": Rostrum minute, lateral cephalic lobe scarcely emarginate anteriorly, anteroventral corner rounded; eyes round, pigment not fully covered by morula of ommatidia.

Antenna 1 of medium extension, ratio of peduncular

articles = 16:12:5 article 1 without teeth, primary flagellum scarcely longer than peduncle, with thick but sparse aesthetascs, accessory flagellum 2-articulate. Antenna 2 elongate, longer than antenna 1, gland cone large, article 5 of peduncle longer than 4, flagellum elongate.

Upper lip broad, entire, almost truncate below.

Mandibular incisors scarcely toothed; right lacinia mobilis thin, left flat, right 4-toothed, left with 2 pairs of teeth weakly divided at extremities; raker spines main row with 5, accompanied by 4 vestigial fern-like setae near molar, left and right sides similar; molars large, poorly triturative, each with weak seta; mandibular palp large, ratio of articles = 11:13:9, article 3 weakly falcate, articles 1 and 2 with inner setae (article 1 with 1 long, 1 small; article 2 with 7 irregular weakly hooked, of various sizes), setae of article 3 = DE (medial with 11, apical with 2). Inner lobes of lower lip large and fleshy, outer lobes with medial gape. Inner plate of maxilla 1 broadly pyriform, leaf-like, fully setose medially, and with facial setae; outer plate slender, with 11 spines; palps 2-articulate, symmetrical, apices truncate, with simple, bifid and pectinate spines, facial setae, and an outer marginal setule. Inner plate of maxilla 2 slightly broader but scarcely shorter than outer, somewhat geniculate, with fully developed oblique facial row of setae, some outer marginal setal spines, sparse medial and dense apical setae; outer plate almost evenly rectangular, with 2 apicolateral setae, and dense apical setae. Inner plate of maxilliped broad, truncate, with 2 inner apical spines, medially and apicolaterally setose; outer plate ovate, medially and apically spinose; palp poorly setose laterally, article 2 elongate, article 3 shorter, not lobate, dactyl shorter than article 3, unguiform, with partly immersed nail, accessory setule and scale-flake.

Coxae 1-5 of medium length, extending equally, only coxa 2 with long setae, one on coxa 1 short and thick, other coxae poorly armed; coxa 1 expanded apically, coxa 2 weakly constricted midposteriorly, coxae 3-4 subrectangular, 4 not significantly excavate, 3 and 4 equally extended, coxa 5 bilobed, coxae 6-7 shorter than 5.

Gnathopod 1 stout, wrist elongate, with moderately dense setal clumps posteriorly; hand short, broad, medial face weakly setose, posterior margin with notch bearing 2 spines (as if situated on false palm), palm almost transverse, weakly sculptured, dactyl very long and overlapping palm. Gnathopod 2 with strongly broadened article 2 and sharp anterior tooth plus accessory tooth; remainder of appendage slender and like that of female, wrist of medium length, hand much longer, thin, tapering, without palm, dactyl short and not folding back far, posterior margins of wrist and hand with groups of apically bent setae.

Pereopods 3 and 4 subequal.

Article 2 of pereopods 5-7 weakly expanded, not lobate, posterior margins weakly setulate, legs slender.

Pleopods ordinary. Pleonites 1-2 each with dorso-lateral setule; epimera 1-3 with sinuous posterior

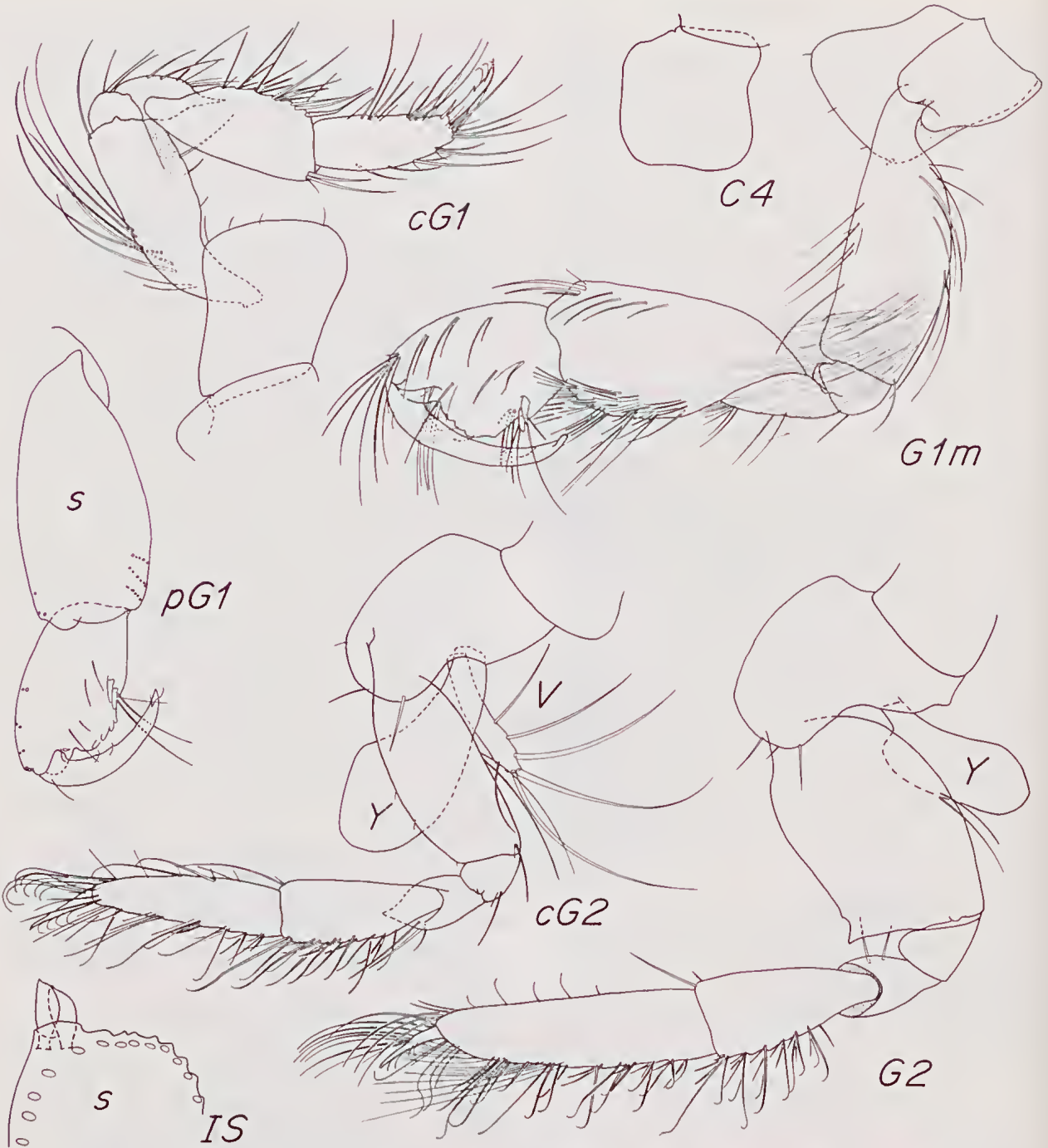


Fig. 6—*Prosocratus butcheri* gen. nov. et sp. nov. Unattributed figures = holotype male "n" 4.34 mm; c = female "c" 3.41 mm; p = male "p" 4.18 mm.

margin and sharp posteroventral tooth marked with weak scutule, ventral margin of epimeron 3 with weak spinule. Urosomite 1 with pair of medium teeth embracing third small tooth enfolding 2 spine setae; urosomite 2 with pair of more widely spaced small teeth each embracing spinules. Uropods 1-2 extending equally, outer ramus of uropod 2 shortened, all rami weakly spinose

marginally and apically; peduncle of uropod 1 with both margins spinose, without basofacial spine, apicolateral margin with small sharp cusp, large spine and small spine; uropod 2 peduncle with 1 lateral and 1 medial spine at apex. Uropod 3 strongly extended, peduncle scarcely elongate, apicodorsal margin with 2 spines in tandem, medial margin with 2 spines in basal group;

gnathopod 2, and article 2 slender; gnathopod 1 actually shorter than 2, with wrist longer than hand; brood plates slender, with few setae.

YOUNG MALE "p": Hand narrower than in adult (Fig. 6).

HOLOTYPE: NMV J1639 male "n" 4.34 mm.

TYPE LOCALITY: WPBES 1707, Australia, Victoria, Western Port, 7 January 1974, intertidal, sand.

PARATYPES: NMV J1640-1642.

PARATYPE LOCALITY: Female "c", 3.41 mm; QUBS Moreton Bay Q., male "p" 4.18 mm; 1 male and 1 female from type locality.

RELATIONSHIP: Although we have placed this species in a genus of its own because of the axial reversal of gnathopodal dominance in the male and the quite distinctive structure of that dominant gnathopod compared to the dominant gnathopod of other Australian taxa in this family group, we must note the very strong resemblance between this species and *Cheirocratus bassi* in dozens of small characters. Most of the morphology of this species could have been illustrated simply by reference to the drawings for *C. bassi*. This is somewhat unnerving as it means there may be very few increments of evolution between this taxon and its ancestors which may lie near *C. bassi* and that the attribution of generic importance we give it may be exaggerated.

Smaller differences between *P. butcheri* and *C. bassi* are to be found in (1) shape of the lateral cephalic lobes of which the anteroventral corner is rounded in *P. butcheri*, weakly produced in *C. bassi* (2) peduncle of antenna 2 which is rather stouter in *P. butcheri*, particularly articles 3 and 4; (3) the shorter and stouter gland cone in *P. butcheri* which reaches barely to M50 on articles 3 whereas in *C. bassi* it extends more than halfway; (4) the left laeina mobilis, which has really only 2 branches in *P. butcheri*, 4 in *C. bassi*; (5) the stronger molar seta and (6) the broader plates of maxilla 2 in *P. butcheri*; (7) subequal and stouter pereopods 3 and 4 in *P. butcheri*; (8) longer dorsal teeth on urosome 1 and shorter urosome 2 in *P. butcheri*.

The females of these two species are not easy to distinguish at a glance, but may be separated by the first gnathopod which in *P. butcheri* has article 6 distinctly shorter than article 5, whereas in *C. bassi* the articles are subequal.

Placed side by side ovigerous females of these species of similar length reveal comparative differences; urosomite 2 is longer in *C. bassi* and the teeth on urosomite 1 are shorter. The gland cone in *P. butcheri* is stouter and shorter. *Prosocratus* appears heavier, due to slightly stouter second antennae, second articles of pereopods, subequal and stouter pereopods 3 and 4.

MATERIAL: CPBS, 1 sample (1 specimen); WPBES 9 samples from 6 stations (32 specimens); WP dredged 1 sample (1 specimen); EBS 1 sample (3 specimens); QUBS 3 samples from 3 stations (20 specimens).

DISTRIBUTION: Western Port, Victoria, to Moreton Bay, Queensland, intertidal, sand, muddy sand, weed (*Posidonia*).

ETYMOLOGY: This species is named for A. Dunbavin

Butcher, former Deputy Director of Conservation in Victoria, in recognition of his major role in the benthic survey programmes in Victoria 1964-74 which have proved so vastly productive of new amphipod taxa.

ACKNOWLEDGEMENTS

We are grateful to Dr Alistair Gilmour formerly Officer-in-Charge, and Dr Leon Collett, of the Marine Studies Group, Ministry for Conservation, Victoria, and to Dr Barry Wilson, Director National Museum of Victoria, for their support of this study. At Smithsonian Institution we are indebted to Roland M. Brown, Janice Clark and Deborah Fcher for their assistance. The Secretary of Smithsonian Institution Dr S. Dillon Ripley made it possible for J. L. Barnard to visit Australia in pursuit of this study. This publication is No. 380 in the Ministry for Conservation Environmental Study Series.

REFERENCES

- BARNARD, J. L., 1972. Gammaridean Amphipoda of Australia, Part I. *Smithson. Contr. Zool.* 103: 1-333.
- BARNARD, J. L., 1974. Gammaridean Amphipoda of Australia, Part II. *Smithson. Contr. Zool.* 139: 1-148.
- BARNARD, J. L. & DRUMMOND, M. M., 1978. Gammaridean Amphipoda of Australia, part III: The Phoxocephalidae. *Smithson Contr. Zool.* 245: 1-551.
- CHEVREUX, E. & FAGE, L., 1925. Amphipodes. *Faune de France.* 9: 1-448.
- GRIFFITHS, C. L., 1975. The Amphipoda of South Africa. Part 5, The Gammaridae and Caprellidae of the Cape Province west of Cape Agulhas. *Ann. S. Afr. Mus.* 67: 91-181.
- KARAMAN, G. S., 1977a. *Cheirocratus arnatus* n. sp. from Suez Region with some remarks to some other members of this genus (Fam. Gammaridae). *Poljopr. Sum.* 23: 43-52.
- KARAMAN, G. S., 1977b. New member of the genus *Cheirocratus* Nor. from Mediterranean Sea, *C. monodontus* n. sp. (Fam. Gammaridae), *Glasn. Rep. Zav. Zast. Prir. Zbirke Titogradu.* 10: 59-68.
- LEDOYER, M., 1967. Amphipodes gammariens de quelques biotopes de substrat meuble de la région de Tulcar (Republique Malgache [sic]). Etude systématique et écologique. *Ann. Univ. Madagascar* 6: 17-62.
- LILJEBORG, W., 1852. Norges Crustaceer. *Ofversigt Kongelige Vetenskaps-Akademiens Förhandlingar, Åttonde Argangen* 8: 19-25.
- NORMAN, A. M., 1867. Report on the Crustacea. *Nat. Hist. Trans. Northumb.* 1: 12-29.
- RATHKE, H., 1843. Beiträge zur Fauna Norwegens. *Verhandl. Kaiserl. Leopoldinisch-Carolinischen Akad. Naturforscher, Breslau* 20 (1): pp. 1-264.
- SARS, G. O., 1895. *Amphipoda. An account of the Crustacea of Norway with short descriptions and figures of all the species.* Christiania, Alb. Cammermeyers Forlag.
- STEBBING, T. R. R., 1906. Amphipoda I. Gammaridea. *Das Tierreich* 21: 806.
- STEPHENSON, K., 1928. Storkrebs II. Ringkrebbs I. Tanglopper (Amfipoder). *Dann. Fauna* 399.
- STEPHENSON, K., 1929. *Amphipoda.* Tierwelt N.-u Ostsee, Leipzig.
- STEPHENSON, K., 1940. The Amphipoda of northern Norway and Spitsbergen with adjacent waters. Fasc 3. *Tromsø Mus. Skr.* 3: 279-362.